

## PolyU Numerical PDEs Seminar

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### Topic

Numerical simulations of three-layer Saffman-Taylor problem in a radial Hele-Shaw cell

### Date | Time

21 February 2024 (Wednesday) | 10:00 – 11:00 (HK Time)

### Zoom

<https://polyu.zoom.us/j/98509244499?pwd=aWlzS2hIUTNTRjVmUGJBd2QyeVFrUT09>

Meeting ID: 985 0924 4499

Passcode: 0221

### Abstract

The three-layer Saffman-Taylor problem introduces two coupled moving interfaces separating the three fluids. We explore full nonlinear interfacial dynamics using a spectrally accurate boundary integral method. In the expanding case, we show that our nonlinear computation are in good agreement with the experimental observations and the linear analysis. Nonlinear simulations reveal that due to the existence of a second interface, the classical highly branched morphologies are replaced by less unstable structures in which finger-tip-splitting and finger competition phenomena are evidently restrained as the initial annulus's thickness is reduced. In a shrinking case, the interaction between the two interfaces introduces novel dynamics leading to rich pattern formation phenomena. In particular, the inner interface can be wrapped by the other. We find that multiple parameters contribute to the dynamics including the width of annular region, the location of the sink, and the mobilities of the fluids.

**ALL ARE WELCOME**